

Answer Key for Practice Exam 1
Multiple Choice

1. Number of programs sold = $(0.40)(800) + (0.50)(1200) = 320 + 600 = 920$

$$P(\text{Program purchased}) = \frac{920}{2000} = 0.46$$

ANS: D

2. Personal Happiness

Use χ^2 to test relationship

| | Happy | Problems | Total |
|-------|-------|----------|-------|
| Died | 315 | 54 | 369 |
| Lived | 8685 | 1071 | 9756 |
| Total | 9000 | 1125 | 10125 |

$$\chi^2 = 4.81$$

$$P(\chi^2 \geq 4.81) = 0.028$$

Alternately, use a 2 proportion z-test

$$P(\text{Died}|\text{Happy}) = 0.035, n_1 = 9000$$

$$P(\text{Died}|\text{Not Happy}) = 0.048, n_2 = 1125$$

$$z = \frac{0.035 - 0.048}{\sqrt{(0.036)(0.964)\left(\frac{1}{9000} + \frac{1}{1125}\right)}} = \pm 2.19$$

$$P(z < -2.19 \text{ or } z > 2.19) = 0.028$$

ANS: A

3. In the event of a non-response the correct procedure is to select another respondent using a random number.

ANS: D

$$4. P(X < 66) = P\left(Z < \frac{66 - 68.04}{2.4}\right) = P(Z < -0.85) = 0.1977$$

$$P(X < 66 \text{ and } X < 66) = 0.1977^2 = 0.039 \approx 0.04$$

ANS: A

5. The distribution of the sum of 100 spins from a discrete random variable will be a sampling distribution with a mean value of 550. As the number of trials increases, the shape of the sampling distribution becomes approximately normal.

ANS: A

6.

Choice I False

$$P(p_{\text{with}} < p_{\text{without}}) = P\left(z < \frac{0.30 - 0.417}{\sqrt{(0.37)(0.63)\left(\frac{1}{40} + \frac{1}{60}\right)}}\right) = P(z < -1.18)$$

$$P(z < -1.18) = 0.118$$

Choice II True 2 proportion z-interval = (-0.31, 0.07)

Choice III False If confidence interval contains zero, there is no statistically significant difference between the two proportions.

Answers I and III are not correct. Corresponds with choice D

ANS: D

7. P-value is the probability of the χ^2 statistic = 0.18641 which shows some relationship between the weight of the individual and the weight they can lift. However, the relationship is weak.

ANS: D

8. Choice I True
Choice II False $\bar{x}_A = 24.65$, $\bar{x}_B = 26.43$
Choice III True
I and III only

ANS: D

9. Choice I True There appears to be some relationship.
Choice II True No assignment was made.
Choice III False There is no proof that the relationship was causal.
Choice IV False No pairing was mentioned.
Incorrect answers are III and IV

ANS: E

10. The selection process does not include all possible groups

ANS: B

11. Total favorable values = $225 - 175 = 50$ $p = \frac{50}{400} = 0.125$

ANS: A

12. Accuracy of a sample depends on sample size, not population size.

ANS: A

13.
$$P(\hat{p} < 0.65) = P\left(Z < \frac{0.65 - 0.71}{\sqrt{\frac{(0.71)(0.29)}{100}}}\right) = P(z < -1.32) = 0.0934$$

ANS: B

14. T-score = 8.7363. Degrees of freedom = 4
 Critical $t_{(0.0005, 4 \text{ df})} = 8.61$. Use two tail t-test.
 Therefore, P-value $0.0005 * 2 = 0.001$
 ANS: B
15. December 2002 implies $x = 35$
 $\hat{y} = 2.7 + 1.01(35) = 38.05$ kw
 ANS: D
16. Random numbers chosen are 0 7 1 1 9 9 7 3 3 6 giving 7, 1, 3, 6 which corresponds to Klein, Zavala, Lonquist, and Elifritz.
 ANS: C
17. InvNormal (0.90) = 1.28
 $1.28 = \frac{40 - 38}{\sigma} \Rightarrow \sigma = \frac{40 - 38}{1.28} = 1.56$ inches
 ANS: E
18. Power deals with the ability of a hypothesis test to detect a significant difference between the actual mean and the hypothesized mean. One way this can be achieved is by increasing the sample size.
 ANS: C
19. $\sigma = \sqrt{Var_1 + Var_2} = \sqrt{4^2 + 7^2} = \sqrt{65}$
 ANS: D
20. A simple random sample requires that each potential member be numbered in some identifiable way. Each member must have an equal chance of being selected and each potential subset must have an equal chance of being selected.
 ANS: E
21. This is a geometric distribution.
 $P(X = 4) = (0.7)^3(0.3) = 0.1029$
 ANS: B
22. Increasing the sample size increases the power of a hypothesis test. Decreasing the sample size decreases the power of a hypothesis test.
 ANS: B
23. InvNormal (0.95) = 1.645
 $1.645 = \frac{x - 55}{4} \Rightarrow x = 1.645(4) + 55 = 61.58$. Closest answer is 62 wpm.
 ANS: D

24. Without a control group, the effectiveness of any experiment cannot be determined. There could be several confounding variables other than the diet that might be responsible for the weight loss.
ANS: D
25. P-value is the probability of randomly obtaining a mean of a sample as extreme or more so as that found in the sample, if the population mean was the stated value.
ANS: C
26. Linear regression equation is $\hat{y} = 11.8 - 1.6x$
Residual value = $y_{\text{actual}} - y_{\text{predicted}}$
Residual of point A = 0.8
Residual of point B = 0
Residual of point C = -1.8
Residual of point D = 0.4
Residual of point E = 0.6
Point C has the largest absolute value.
ANS: C
27. This is a probability distribution. Let \bar{x} = mean salary.
 $\bar{x} = (0.30)(75,000) + (0.50)(54,000) + (0.20)(36,000) = \$56,700$
Mean donation = $(0.05)(\$56,700) = \$2,835$
Total donation = $(\$2,835)(50) = \$141,750$
ANS: E
28. The question asks for the difference in the number of marks made by each hand. The appropriate test is a one sample t-test with $H_0: \mu = 0$ vs. $H_a: \mu \neq 0$.
The differences are 3, 13, -19, -1, 12, 12, -4, 11, 14, -14. $\bar{x} = 2.7$, $s = 11.94$.
 $t = \frac{2.7 - 0}{\frac{11.94}{\sqrt{10}}} = 0.715$. $P(t < -0.715 \text{ or } t > 0.715) = 0.493$
ANS: C
29. Residual plots should be randomly scattered with no apparent pattern. #1, #2 and #4 have a definite pattern. #5 is not scattered. #3 is the one that appears to be randomly scattered.
ANS: C
30. C.I. = $\bar{x} \pm t^*_{(0.98, 9 \text{ df})} \frac{s}{\sqrt{n}}$. $C.I. = 32.7 \pm 2.821 \frac{4.3}{\sqrt{10}} = 32.7 \pm 3.84$
ANS: E
31. Confidence intervals are used to *estimate* the value range of a population mean from a sample. There is no need to compute a confidence interval if the population data is already known.
ANS: C

32. $P(\text{Suburban} | 8\text{days vacation}) = \frac{32}{71} = 0.31$

ANS: B

33. $P(\text{Not donuts or Not cinnamon rolls}) = 1 - (0.30 + 0.40 + 0.10) = 0.20$ or 20%

ANS: B

34. No treatment is imposed. Workers voluntarily decided how to divide themselves.

ANS: B

35. 3 orchards have yields between 60 and 80 bushels/acre. 2 orchards have a yield between 80 and 100 bushels / acre. There are a total of 5 of 20 orchards with yields above 60 bushels / acre = 0.25

ANS: D

36. The mean weight loss from Looze-Now was actually less than the mean weight loss of the control group. The weight loss likely is due to the placebo effect.

ANS: C

37. A condition of any experiment and the associated hypothesis test is that the data comes from a randomized situation.

ANS: A

38. The Confidence Interval for differences must contain only positive values to support a claim of preferential salaries for tall people.

ANS: D

39. This is a time plot. The variable of interest is the number of people employed which is shown on the vertical axis. Skewness is not considered on time plots. The mean is about 5,000. So choice III is correct, but no other choices are correct.

ANS: E

40. Find the critical χ^2 value for $\alpha = 0.05$ and degrees of freedom = 3.

ANS: C